

Federated Learning for Smart Healthcare: A Survey

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Abstract

Recent advances in communication technologies and the Internet-of-Medical-Things (IOMT) have transformed smart healthcare enabled by artificial intelligence (AI). Traditionally, AI techniques require centralized data collection and processing that may be infeasible in realistic healthcare scenarios due to the high scalability of modern healthcare networks and growing data privacy concerns. Federated Learning (FL), as an emerging distributed collaborative AI paradigm, is particularly attractive for smart healthcare, by coordinating multiple clients (e.g., hospitals) to perform AI training without sharing raw data. Accordingly, we provide a comprehensive survey on the use of FL in smart healthcare. First, we present the recent advances in FL, the motivations, and the requirements of using FL in smart healthcare. The recent FL designs for smart healthcare are then discussed, ranging from resource-aware FL, secure and privacy-aware FL to incentive FL and personalized FL. Subsequently, we provide a state-of-the-art review on the emerging applications of FL in key healthcare domains, including health data management, remote health monitoring, medical imaging, and COVID-19 detection. Several recent FL-based smart healthcare projects are analyzed, and the key lessons learned from the survey are also highlighted. Finally, we discuss interesting research challenges and possible directions for future FL research in smart healthcare.